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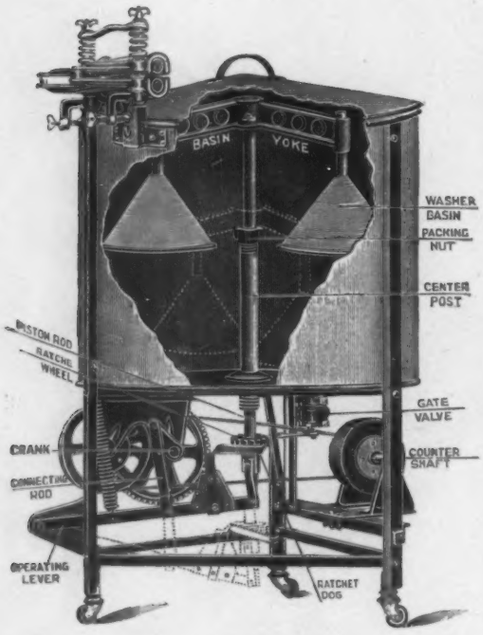
Where to Buy It in the West, Pages 9, 10. Alphabetical Index to Advertisers, Page 8.



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POWER AND GAS
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VOLUME XXIX SAN FRANCISCO, OCTOBER 19, 1912 NUMBER 16

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ELECTRICAL FIXATION OF ATMOSPHERIC NITROGEN

The past fortnight has seen much flurrying in hydroelectric circles of the West due to the Western visit of Dr. Samuel Eyde, the well-known inventor of the Birkeland-Eyde processes of electrically bringing about oxidation of atmospheric nitrogen and the development of the resulting industries in Norway. During the past week Dr. Eyde has interestingly discussed his installation and process with many men on the coast

Giant Schoenherr and Birkeland-Eyde Furnaces at Rjukan, Utilizing Energy From the Largest Hydroelectric Plant in the World, 140,000 H.P.

chemical combinations with atmospheric nitrogen. Dr. Eyde is now in search of available cheap water power to the extent of 200,000 h.p.

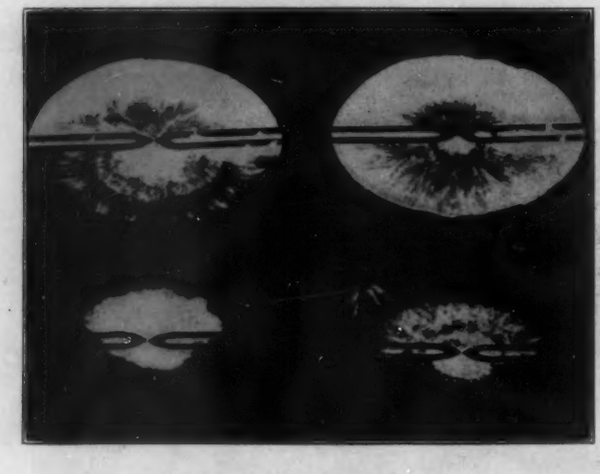
At the recent international congress of applied chemistry in New York, Dr. Eyde presented the most interesting paper of its sessions on his method of engaged in hydroelectric development. The illustrations furnished herewith were personally presented to this journal by Dr. Eyde and the following description is abstracted from his New York lecture.

We all know that the atmosphere surrounding us is composed of nitrogen and oxygen; to create by the

union of these two elements new chemical combinations that can be utilized in the world's household is the task of the new industry.

In order to explain the Birkeland-Eyde method, it is necessary first to describe the electric flames consisting of arcs of light, which are used in the electric furnaces.

The formation of the flame occurs by an arc of the electric flame being formed between the points of the electrodes, which are close to each other. By this means a movable and flexible current is established in a highly magnetic field. The electric arc that has been formed moves on account of this magnetic field with great velocity perpendicularly to the lines of force, and the electric arc's foot draws back from the points of the electrodes. When the length of the electric arc increases the electric resistance becomes greater and the tension increases, until it becomes so great that the new electric arc starts from the points of the electrodes.



Flame in Electric Furnace.

To regulate the current, an inductive resistance is used in series with the flame. With alternating current all the arcs are formed alternating in opposite directions and appear to the eye to be circular discs. This flame provides a powerful technical means for the oxidation of the nitrogen of the air. The flame in our furnaces burns with a steadiness that is really astonishing.

The electrodes are thick copper tubing, through which water passes for cooling purposes. The chamber in which the flame burns is circular, of only a few centimeters in width, and about three metres in diameter.

The interior of the furnaces is lined with fire clay brick, through the walls of which the air is admitted to the flame. The nitrous gases formed in the flame escape through a channel made along the casing of the furnace, which, like the flame chamber, is furnished with fireproof bricks.

In order to supply the furnace with the amount of power desired, each one is furnished with an induction coil, by means of which the power is regulated as required. The induction coil serves, moreover, to keep the flame in the furnace steady and even while working.

With this furnace we have obtained such a steady working that it burns for weeks without any regulation worth mentioning. It may further be stated that the maintenance of the furnace and its repair are simple, as the most exposed portions, the electrodes, need be changed every third or fourth week, and then only a small part of them. The fireproof masonry is changed every fourth to sixth month.

The temperature in our flames exceeds 3000 degrees centigrade. The temperature of the escaping gases may vary between 800 and 1000 degrees. The furnaces are made of cast steel and iron, the middle of the furnace being in the form of a circular flame chamber. The electrodes are led radially into this flame chamber. By aid of centrifugal fans the air is brought into each furnace through tubes from the basement. From furnaces which consumed an energy of some few horsepower, we have attained to types which can, as mentioned, take an energy of more than 5000 h.p.

We have in course of the development of our method had four experimental stations.

Interior of Electric Furnace.

Some years after the perfection of our furnace, Dr. Schoenherr, with the electrical engineer Hessberger, of the Badische Company, perfected an electric furnace for the oxidation of atmospheric nitrogen which is constructed on quite different principles. In place of the great disc of electric flame he developed a long slender arc in the axis of a narrow iron tube through which a current of air is forced.

The type now used consists of a somewhat slender vertical column of iron plates 7 metres in height. The inner tube is the reaction chamber, the others form channels for the entrance of the air current and its exit after coming in contact with the flame. In this way the heat of the outgoing gas is transferred to the ingoing current.

At the lower end is the main electrode which is movable in a vertical direction, as it must be raised from time to time when the end is worn away by the arc.

The reaction tube serves as the second electrode. By means of a lever the space between the electrode and tube can be bridged over and the arc formed.

The air current forced by a powerful aspirator enters in the lower part of the furnace and passes the channels. The entry into the reaction chamber is through a number of small tangential openings ar-

ranged in several horizontal rows in the sides. The current passes in this way around the chamber and the arc is driven up in the midst of the rapidly moving current of air.

As a rapid cooling is of importance in securing a good yield, the upper third of the tube has a water jacket through which the gases pass, and in this way the reverse reaction is prevented to a notable degree.

The reaction is identical with that obtained in the Birkeland-Eyde furnace, and the yield, as far as the results now obtained is practically the same.

I will describe the process and give you some details of the various parts of the factory.

The air for the furnaces is procured by swiftly revolving ventilators, and is conducted through large iron pipe lines to the furnaces.

At Notodden we have only furnaces of the Birkeland-Eyde system, from 1000 to 3000 kw. capacity. At Rjukan there are, however, furnaces of the Birkeland-Eyde system of 3000 kw. as well as furnaces of the Schoenherr system, all of 1000 kw.

When the air in the flame chamber has been acted upon by the electric flame the nitrous gases formed pass out through pipes, which convey the gas to the steam boilers, in which the temperature, which was 1000 degrees C., is reduced.

The steam produced in the boilers is utlized in the further treatment of the products. In the boiler house there are also air compressors, which supply compressed air for pumping acid and lye in the various chemical departments.

The gases pass on from the steam boilers through an iron pipe into the cooling house, and complete the cooling begun in the steam boilers.

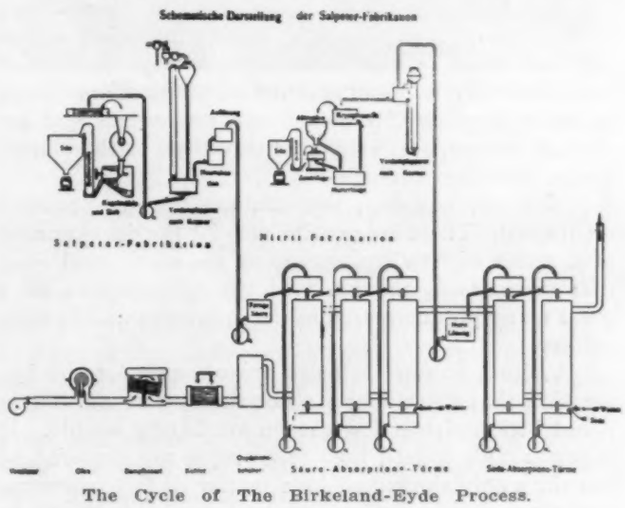
Each cooler consists of a great number of aluminum tubes, over which cold water runs, while the hot gases pass through them. The temperature of the gas is considerably reduced. From the cooling chambers the gases pass to the oxidation tanks.

These oxidation tanks are vertical iron cylinders, lined with acid proof stone. The object is to give the cooled gases a sufficient period of repose, in which time the oxidation of the nitrogen oxide may occur. The necessary amount of oxygen is present in ample quantity in the air which accompanies the gases from the furnaces. From the oxidation tanks the gases by blast engines are led into the absorption towers.

The towers are filled with broken quartz, which is neither affected by nitrous gases nor by nitric acid. To assist the passage of the gases on their way from the furnaces there are centrifugal aluminum fans on each row of towers.

The gases enter at the base of the first tower, go up through the quartz packing and thence by a large earthenware pipe enter the top of another tower, through which they pass downwards through the quartz to the bottom of the third tower, and so on, until the air, relieved of all nitrous gases, leaves the last tower. Water trickles through the granite towers, and this is gradually converted into a weak nitric acid, while the liquid used in the iron towers is a solution of soda. The absorbing liquid enters the top of the tower and is distributed in jets by a series of earthenware pipes, so that the permeating gases enter into immediate contact with the absorbing liquid. Nitric acid is thus formed in the granite towers and in the iron towers a solution of nitrate of soda.

The liquid emerges in a constant even stream from the bottom of the towers, running into a granite cistern. It then flows in to the montejus which serve to pump up the acid, which has to pass repeatedly through the tower before it has become strong enough for the purpose for which it is intended. The montejus are worked by compressed air and send the acid up into large stoneware tanks. From these jars the acid again runs through the towers. The montejus work automatically.



The Cycle of The Birkeland-Eyde Process.

The iron towers are percolated, as already mentioned, by a solution of soda, otherwise the whole process is practically similar to that in the granite towers. The solution of soda owing to its far greater power of absorption, effects the separation of the last remaining traces of nitrogenous gases from the accompanying air. Of the entire quantity of nitrous gases passed through the absorption system, about 97 per cent is absorbed. The finished nitric acid coming from the towers, which has a strength of about 30 per cent by volume, is collected in granite cisterns, from which it is drawn to what is called the "dissolution works." These consist of granite vats filled with limestone, over which the acid is poured. This drives off, with violent effervescence, the carbonic acid of the limestone. The nitric acid takes its place and forms a watery solution of nitrate of lime or calcium nitrate. The rest of the acid is neutralized in small towers filled with milk of lime and is now pumped into vacuum evaporating apparatus. A great saving in heat is effected by boiling in vacuum.

The steam required for the evaporation is obtained from the steam boilers, heated, as before mentioned, by the furnace gases. The concentration of the nitrate solution in the evaporizing plant is continued until the specific weight of the liquid at an even temperature shows a content of 13 per cent nitrogen. This solution is then sufficiently evaporated, and can be pumped up into the solidification chambers, where it is conducted upon a revolving cylinder, cooled on the inside. It then stiffens so rapidly that it will easily spring off into small leaf-like pieces, which can

be granulated without difficulty in the crushing mill. There the mass is reduced to a granular state.

The coarse powder produced is raised by an elevator to a vat, from the bottom of which it is dumped into casks holding 100 kilos net weight.

The gas lead into the iron tower forms with the solution of caustic soda, a solution of nearly pure sodium nitrite. This is concentrated by evaporation in the same sort of apparatus as above and allowed to crystalize. The crystals are dried in a centrifuge and put up in casks.

The barrels are made at our own cooper's shop and are lined with paper to guard against damp.

In addition to these two products, nitrate of lime and nitrite of soda, we have during the last years at our Notodden works taken up the manufacture of concentrated nitric acid and nitrate of ammonia, which products have already established themselves and are shipped in comparatively large quantities to the United States and other countries.

We are, however, not confined to the products mentioned. There are possibilities for the development of a series of new industries, as the nitric acid—our first product—is the basis of the manufacture of a great many products used in the industries and in agriculture.

Visitors to our factories are often under the impression that the works are not running at all. There is but little noise and workmen are hardly visible. It is remarkable indeed how few people are required to run the establishments. As a matter of fact comparatively large working forces are only needed in the packing and wrapping departments.

For the development of the atmospheric nitrogen industry the question of water power is a vital one. Hence the Norwegians have given this question as much attention as the chemical part of the manufacture. Our industry cannot exist unless it can procure cheap water power. But there is hardly a country in the entire world that can boast of more favorable conditions in this respect than Norway, and the enormous rise of our industry must be attributed to a very large extent to Norway's magnificent opportunities in the amount of water power available for manufacturing purposes. It must be borne in mind that Norway has not only her magnificent and high waterfalls but that she has large mountain lakes, permitting the construction of enormous natural reservoirs for conveying the water to the power stations. In our districts we enjoy the most favorable conditions in this respect. The works now built are all situated in the southeastern part of Norway, in the Telemark river district.

The most important works, the Notodden nitrate factories, are admirably situated on the lake of Hiterdal, about 50 ft. above the level. A short channel with a series of locks, permits communication with the town of Skien, an important seaport at the head of the fjord. Under present conditions vessels of 200 tons burden can ascend to Notodden. It is planned to enlarge the locks so as to allow the passage of seagoing vessels of 2000 tons. The ability to ship directly to all parts of the world by water, with one transhipment, is an important factor in the future of the Notodden nitrate industry.

The Notodden factories, which now use about 60,000 h.p., secure their power from two neighboring waterfalls, Lienfos and Svaelgfos. At Lienfos, about two miles from Notodden, a dam with a fall of about 55 ft. was completed in 1911. The volume of water is 75 cubic metres per second. The power station is equipped with four units, of 5000 h.p. each. The Svaelgfos power house is situated above and about one mile from Lienfos. The volume of water is the same as at Lienfos. The dam has, however, a fall of about 165 ft. A tunnel takes the water to the reservoir, from which four flumes cut into the solid rock conduct the water to the station, where there are four sets of turbine generators of 10,000 h.p. each.

The generators are capable of producing 13,000 h.p. and rank among the largest units in the world.

The power of these two waterfalls is transmitted to Notodden by six separate transmission lines. Each line consists of six cables, 12 millimeters in diameter. The three-phase alternating current of 50 periods is transmitted with a voltage of 10,000.

Mammoth Electric Furnaces at Notodden, Norway.

A second power station at Svaelgfos is now under construction. As the normal volume of water by an additional regulation of distant lakes in the same watershed will soon increase to 90,000,000 cbm., in the new power station, two units of each 10,000 h.p. will be built.

About 16 miles further up the river the first regulating dam at the Lake of Tinn was constructed at the same time as the water station of Svaelgfos and the factories at Notodden. The immense basin created by this dam makes it possible to store up fully 300,000,000 cubic metres of water.

For transportation purposes to and from the Rjukan factories it has been necessary to build two railways, one of 19 miles, from Notodden up to the lower end of the Lake of Tinn, and one of ten miles, from the lake up to the factories at Saaheim. Ferryboats and large barges provide transportation on the lake between the terminals of the railways.

The railroad from the lake up the narrow valley to Saaheim passes just beneath the large mountain Gausta; a few miles further up Saaheim and the factories are situated.

The transmission line is built on heavy iron masts, About two and one-half miles from the factory up in the valley lies the power station, a large building of granite, about 120 metres long. The Rjukan waterfall

Lienfos Power Station, Developing 20,000 H.P.

lies one mile further up in the valley. It is not only this waterfall itself, but the total fall in the river of a distance of about six miles which is to be harnessed up.

It is planned to have two power stations. The first, now in operation, lies at Vemork, on a ledge of the cliff, 1000 ft. below the terminal reservoir of the tunnel. The water is conducted from the reservoir down the mountain side to the turbines in ten huge flumes, side by side. These flumes are five feet in diameter. The upper sections are of riveted steel plates; the lower, where the pressure reaches 30 atmospheres, are made of welded plate, one inch in thickness. They rest upon a foundation built upon the solid granite of the mountain.

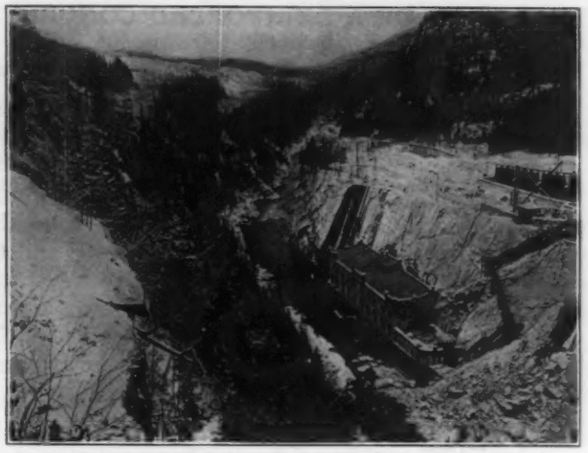
The water descends 971 ft. to the Vemork turbines. Immediately upon leaving the power station the water enters another tunnel, excavated in the side of the cliff, and is conveyed to a point slightly more than three miles down the valley where a similar series of flumes for the second power house is now under construction. The total fall here is 909 ft.

When in full operation the two power stations will furnish the factories with 250,000 h.p., perhaps 270,000 h.p.

In the Vemork power house are ten units of 14,000 h.p. Pelton wheels are used in the turbines on account of the great pressure of the water. They have a maximum capacity of 17,500 h.p. A three-phase alternating current of 50 periods is transmitted from this power house to the nitrate works through 60 wires, partly of copper, but chiefly of aluminum. The working voltage is 10,000.

The reservoir on the top of the flumes is blasted out of solid rock from the intake, where a dam is built across the river. For the regulation of the water supply a dam has been built at Lake Mosvand by means of which the level of the lake is raised over 46 ft. As the surface of the lake is not less than 23 square miles, nearly 900,000,000 cubic metres can be retained. The minimum flow in the river is in this way increased from 5 to 47 cubic metres per second, or the water power at Rjukan only, from 30,000 to 250,000 h.p.

To give you an idea of the development of our industry I review the factories we have had at the different times:



Svaelgfos Power Station, Developing 40,000 H.P.

Dates.	Factories.	No. H.P. Utilized.	Employees.	Workmen.
July, 1903	Frognerkilens Febrik	25	2	2
Oct., 1903	Ankerlokken	150	4	10
Sept, 1904	Vasmoen and Arendal....	1,000	6	20
May, 1905	Notodden	2,500	4	35
May, 1907	Notodden and Svaelgfos ..	42,500	12	403
Nov., 1911	Notodden, Svaelgfos, Lienfos and Rjukan I	200,000	143	1,340

If you ask me what above all has contributed to such a rapid development of our industry, then I wish to mention the confidence the financial people gave me and the excellent collaboration between my engineers and myself. We are all working to create something great and useful for our country, and we all had in view the great importance this new industry would have from an international point of view.

THE RELATION OF THE HORSEPOWER TO THE KILOWATT.

There was, before 1911, no precise definition of the horsepower that was generally accepted and authoritative, and different equivalents of this unit in watts are given by various reference books. It is obviously desirable that the horsepower represent the same rate of work at all places. The value most used in electrical practice has been the round number, 746 watts, and in 1911 the American Institute of Electrical Engineers adopted this as the exact value of the horsepower. Thus defined, it is the rate of work expressed by 550 foot-pounds per second at 50 degrees latitude and sea level, approximately the location of London, where the original experiments were made by James Watt to determine its value. The number of foot-pounds per second in a horsepower accordingly varies with the latitude and altitude. This value, 746 watts, will be used in future publications by this Bureau as the exact equivalent of the "English and American horsepower." The horsepower tables in this Bureau's Tables of Equivalents formerly assumed 550 foot-pounds per second as the correct equivalent at 45 degrees latitude, because of the well-established use of 45 degrees as a standard latitude. This gave the inconvenient relation, 1 horsepower = 745.6494 watts.

The "continental horsepower," which is used on the Continent of Europe, is similarly most conveniently defined as 736 watts, equivalent to 75 kilogrammeters per second at latitude 52° 30′, or Berlin.

THE DESIGN OF A REINFORCED CONCRETE FLUME.

BY B. A. ETCHEVERRY.

A reinforced concrete flume which has been installed in the Northwest and which has proved thoroughly satisfactory is described in the following notes:

The accompanying drawing gives the rectangular flume section to be used wherever necessary on the main canal between the heads of pipe lines F and G, as dimensioned in the table below. The flume sections for the remainder of the canal will be similar, varying only in size. The dimensions of flume sections for the different parts of the main canal and for the elevations shown are tabulated below.

Dimensions of Concrete Flume Section for Main Canal.

Section of main canal.	Required carrying capacity in cubic feet per second.	Inside bottom width in feet.	Inside total depth in feet.	Depth of water in feet.	Carrying capacity with freeboard of 6 in.	Elevation of water surface. At upper end.	Elevation of water surface. At lower end.
F-G	28.00	4.00	2.25	1.75	28	1158.00	1153.00
G-I	15.65	4.00	2.00	1.50	15.65	1140.50	1137.50
I-J	11.30	3.50	2.00	1.50	11.30	1137.50	1136.75
J-K	8.19	3.00	2.00	1.50	9.0	1137.50	1136.00
K-L	4.56	2.00	2.00	1.50	6.0	1136.00	1135.00

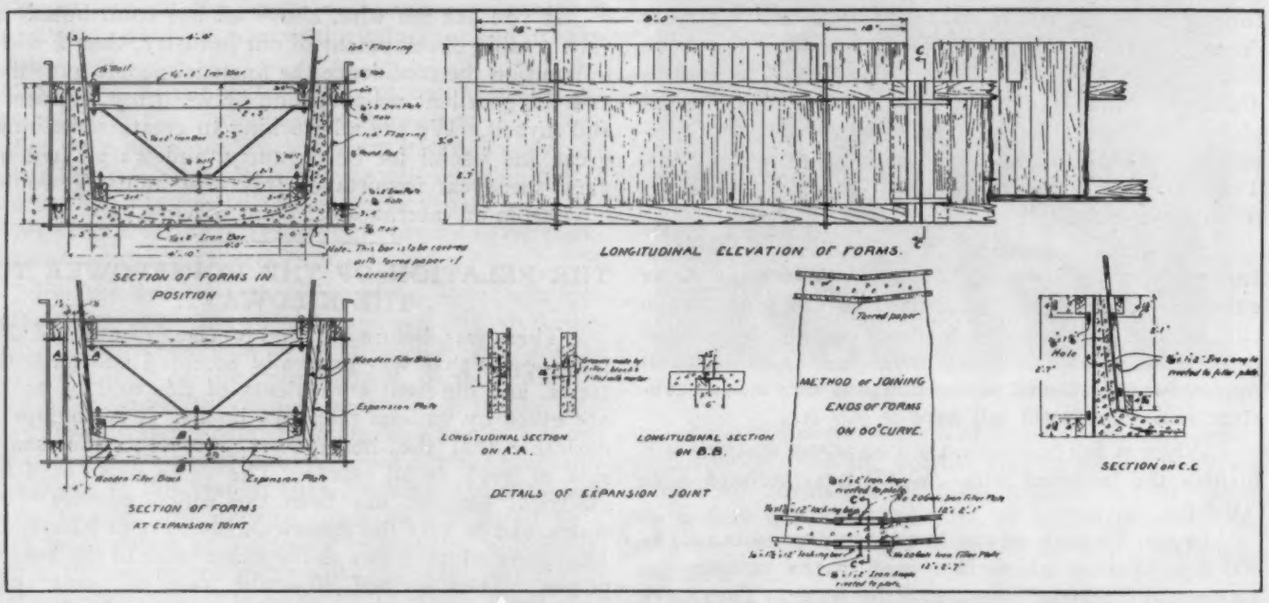
It may be feasible to use the trapezoidal section for most, if not all, of the main canal. Where feasible the trapezoidal section should be used.

Flume Supported on Two Piers.

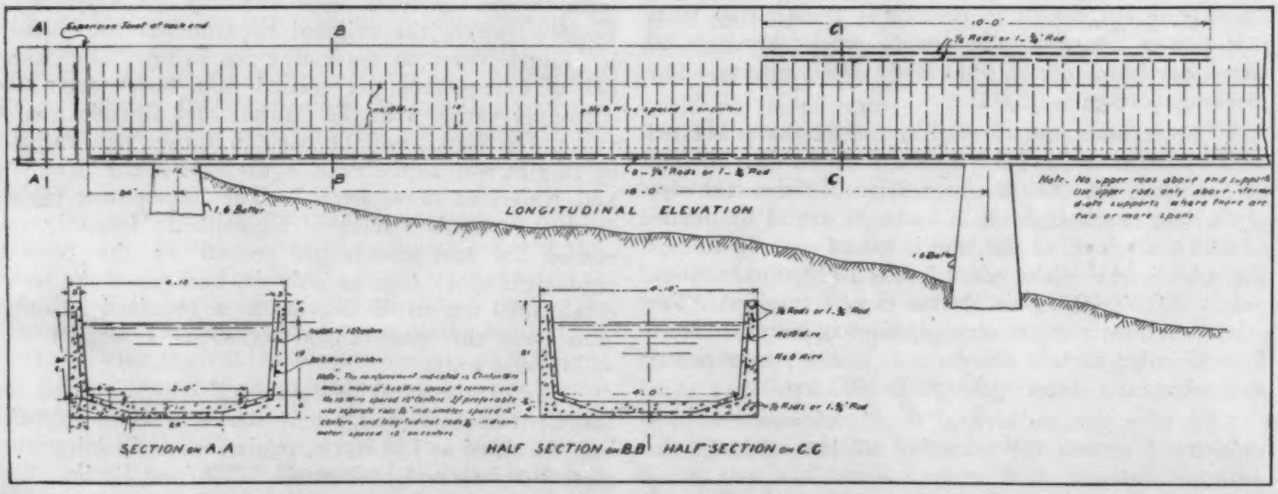
The drawing shows a longitudinal elevation of the flume supported on two piers, the span between being 18 ft. This form of construction can be used to advantage to cross a short depression where it will be more economical to do this than to go around it by means of sharp curves, or to construct a flume on filled ground and be safe against settlement. Usually the flume will be supported on a bench cut in the side hill and will have the cross section shown in the drawing as cross section A-A.

Concrete Flume Constructed on Bench.

This flume consists of the side walls 3 in. thick at the top and 5 in. thick at the bottom and a floor 4 in. thick. The reinforcement shown is Clinton wire mesh made of No. 6 wire 4 in. apart and No. 10 wire 12 in. apart. This reinforcement will cost probably 2¼ or 2½ cents a square foot and may be purchased in rolls, the maximum width of the rolls being 108 in. For


LONGITUDINAL ELEVATION OF FORMS.
SECTION OF FORMS IN POSITION
SECTION OF FORMS AT EXPANSION JOINT
DETAILS OF EXPANSION JOINT
LONGITUDINAL SECTION ON A.A.
LONGITUDINAL SECTION ON B.B.
METHOD OF JOINING ENDS OF FORMS ON 60° CURVE.
SECTION on C.C

Concrete Forms for Canal.



Main Canal as Concrete Flume.

our purpose, in order to provide an expansion joint every 16 ft., rolls 8 ft. wide would be best. The rolls will be cut in lengths of 9 ft. and bent to conform with the drawing and placed across the flume between the forms. The sheets should overlap along the edges to make the reinforcement continuous longitudinally. With this reinforcement the thickness of the walls and floor could be decreased by 1 in., but I believe that it would be difficult to construct thinner walls. If the walls and floor are constructed at the same time, so as to form a monolithic structure, I believe no reinforcement is necessary, for the tension on the concrete without the reinforcement is only 15 lb. per square inch. But unless it is found that the reinforcement increases the difficulty of construction very seriously, I would prefer to use it. A lighter reinforcement could be used, and if Clinton wire mesh can not be obtained, some other form of fence wire mesh could be substituted for it.

Flume Supported on Piers or Resting at the Two Ends on Solid Rock.

This form of construction differs from that of the flume supported on the bench in that there is additional longitudinal reinforcement to make the side walls act as girders or beams across the span. In this case all the reinforcement shown must be used, for the floor is held by the side walls and acts as a floor slab and must necessarily be reinforced. The girder reinforcement when there is one span only will consist of the two lower ½ rods. When there is more than one span, intermediate piers will be necessary and above each pier in the top of the side walls two ½ rods are required to resist the negative bending moment. The two lower rods of the side wall must either be sufficiently long to reach over the entire span or may be built of pieces, the end overlapping not less than 24 in.

The piers must extend down to solid rock or, if built on ordinary firm soil, must be supported on a concrete footing bed 3 ft. by 5 ft. and 1 ft. thick. The top of the piers must be well oiled or preferably covered with a piece of tarred paper before constructing the flume, in order to prevent adhesion with the under side of the floor and permit expansion and contraction without producing stress on the pier. Expansion joints at each of the two end supports will be sufficient.

The flume will be constructed with the same forms and in the same manner as the flume supported on the ground surface, except that some provision must be made to construct the floor slab and support the forms and the flume across the span during construction. This may be done in two ways: first, by using a wooden floor between the piers and level with their tops, supported on stringers and post; second, by building a fill between the piers and level with their top. The first method is best where the height of the floor above the ground surface is large; it will not be as expensive as might seem, for the same wooden form and stringers could be used for all heights, varying only the height of the posts. The second method is best where the height is not large. Where the flume is built on filled ground the piers extending down to solid foundation and the longitudinal reinforcement are necessary to prevent any damage due to settlement.

Design of Forms.

This design is for a concrete flume on a main canal where the flume is 2 ft. 3 in. deep and 4 ft. wide on the inside. The same design will apply, however, to the other sections of the main canal by modifying the dimensions of depth and width. The forms are 8 ft. long and consist of an inside trough and two outside walls. The side walls of the inside trough are made of flooring nailed vertically to the 3 in. x 4 in. longitudinal pieces. The top of the walls extend 9 in. above the top of the outside forms to facilitate the placing of the concrete. The two side walls of the inside troughs are bolted to spacing frames which are made of two horizontal, 2 in. x 3 in. pieces, connected to a diagonal bracing made of ¼ in. x 2 in. bent iron bar. These spacing frames are placed 5 ft. apart, 18 in. from each end of the form. The connection is made with bolts in order that the same side walls could be used for flumes of smaller width but of the same height by varying the spacing frames only. At each spacing frame a horizontal iron bar, ¼ in. thick by 2 in. wide and about 6 ft. long, is bolted to the spacing frame and the top longitudinal piece of the side wall. The purpose of this bar is to support the inside form on the outside form walls and to hold the outside walls and inside form in their proper position. The inside form is not collapsible and I believe it is not necessary that it should be, for the side walls have an inside batter of 2 in. in the depth of 2 ft. 3 in. and are made of smooth flooring placed vertically to decrease the friction. By keeping the forms well oiled there should be no difficulty in lifting the forms after the concrete has hardened. If there is a large length of concrete flume I would recommend lining the inside form with thin galvanized iron.

Concrete Flume in Construction.

The outside form walls are also made of vertical flooring nailed at the top and bottom to 3 in. x 4 in. longitudinal pieces. Each outside form wall is held at the correct distance from the inside wall by a ½ round rod which passes vertically through a ⅝ in. hole made

in the top horizontal bar at each spacing frame, and through corresponding holes made in plates screwed to each longitudinal piece of the outside wall and into a hole made at one end of another horizontal bar placed on the under side of the floor, on the ground surface. This bar could be eliminated where the character of the material will permit the driving into the material of the vertical round rod or of bracing pegs. This lower horizontal bar is taken out after the removal of the forms, and to prevent the adhesion of the concrete to it, it should be well oiled or preferably covered with a strip of tarred paper. The floor will be made level and given the proper thickness by using a straight edge of the form indicated below, which will rest on the two lower longitudinal pieces of the inside form.

Expansion Joint.

The expansion joint shall be spaced 16 ft. apart and will be formed by placing in the forms a 6 in. strip of No. 16 galvanized iron between tapered wooden filler blocks, as shown in the drawing. The flume is built continuously and the plates with the filler blocks are placed 16 ft. apart. The filler block under the plate in the floor slab is removed before the construction of the next floor section, but this can follow very soon afterwards, for even if the two sections run together at the joint, it will be a weak place, especially if the edge of the filler block was well oiled. The other filler block will be taken out after the removal of the forms. The grooves formed by the filler block will then be filled with a rich, stiff mortar which will complete the joint. To obtain a good expansion joint all the contact surfaces except that between the mortar and the metal plate must be well oiled to prevent strong adhesion. The ends of the plate projecting into the concrete walls should be well oiled to permit contraction, the ends of the plate acting as a tongue. The contact surfaces between the mortar and the concrete should be well oiled to give a weak bond. To obtain a good bond between the mortar and the metal plate, it would be desirable to take a hatchet or pick or other sharp instrument and perforate the metal surface which is exposed in the groove after the removal of the filler blocks.

Method of Joining End of Forms on a Curve.

When constructing the flume on a curve the ends of the forms will not butt up close together. To fill the space between the ends of the walls of the forms when this is only a narrow crack, a piece of tarred paper will do, but for a wider space a filler plate as shown in the drawing is to be used. The filler plate is made of thin galvanized iron, is 12 in. wide, 2 ft. 7 in. long for the outside wall and 2 ft. 1 in. long for the inside wall. On the center of the plate and longitudinally a ⅛ in. x 1 in. x 2 in. iron angle is riveted to it. In the long leg of this angle rectangular holes ⅜ in. x 1⅝ in. are made for the insertion of locking bars, which not only hold the filler plate in position but also hold the adjacent ends of the forms at the same level.

THE SOCIETY FOR ELECTRICAL DEVELOPMENT.

As the direct result of the co-operative meeting held at Association Island, Henderson Harbor, N. Y., September 3, 1912, "The Society of Electrical Development" has been formally organized at a meeting of the Organization Committee. The next meeting will be held in the Engineering Societies Building, in New York City, on October 18th.

The above information is perhaps of even greater importance than it appears in cold type, for the forming of the new society really means the getting together of the four branches of the business, central station, manufacturer, jobber and contractor, in an endeavor to develop co-operatively the business as a whole so that each interest will be benefitted. The plans will include a central bureau for the carrying on of the work, which will be along the lines of advertising and publicity for the education of the publice to the greater uses of electricity for light, heat and power and mutual education along advertising and selling lines in an endeavor also to improve the present distributing channels and in every way develop the most efficient methods for advancing the interests of the business.

COMMUNICATION ON SEATTLE LIGHTING RATES.

To the Editor: In the September 14th issue of the Journal of Electricity, Power and Gas there is an article by J. D. Ross on the light and power rates of the Seattle municipal plant. The writer states that when the city plant first began to operate in 1904 the competing company had a rate of 20c per kilowatt hour, and that this rate was later reduced to 12½c per kilowatt hour, based on the connected load.

I want to make a correction, particularly so, as Mr. Ross, superintendent of the Seattle municipal plant, has repeatedly misstated in publications issued by himself the rates charged by the competing company, and which company is the company that I have been connected with since 1899. The rate was only 20c per kilowatt hour for the first 30 hours burning of the maximum demand, after which the rate dropped to 5c per kilowatt hour, with a discount of 10 per cent. Likewise, this company never had a rate of 12½c—the rate was 12c for the first 60 hours burning of the maximum demand and 3c for all excess, with a discount of 10 per cent.

I have upon two different occasions called the attention of Mr. Ross to the error he has made in citing the rates formerly charged by this company, but he persists in continuing to misstate the rates, and I would be pleased if you can have your readers' attention called to these errors.

W. J. GRAMBS.

[In connection with the above communication Mr. Grambs submits correspondence from the city council requesting the Puget Sound Traction, Light & Power Company to bid on the street lighting and a copy of their bid to the city. This bid is on the basis of one cent per kw.-hour delivered to the municipal substation, or a rate of 2¾ cents per kw.-hour if the company operate and maintain the street lamps and street lighting system as at present operated and maintained by the city; further provision being made for rental of municipal poles. This bid was referred to the city utilities committee at the last meeting of the city council. The municipal authorities have recently increased the charges for street lighting from 4 to 4½ cents.—Editor.]

READINESS TO SERVE METHODS.[1]

BY ROSS B. MATEER.

Readiness to serve methods, had their origin with Henry and Doherty, now a prominent feature in the financial, managing and operating of central stations.

As early as 1902, Mr. Doherty analyzed the costs of central station operation as consisting of three factors and based the charge for service upon them in his effort to arrive at a fair and equitable rate for current as a commodity.

First, a yearly demand charge regulated and fixed according to the hourly maximum demand of appliances, or lamps connected, which charge takes care of all fixed expenses of a company such as occasioned by the installation of the proper distribution systems, interest on investment, taxes, depreciation, etc.

Second, a fixed consumer charge to cover such expenses as are occasioned by investment in, installation, maintenance, removing and reading meters, billing, collecting, office work, free work, etc.

Third, a charge for current representing the consumption, which governs all items varying in proportion to consumption, such as fuel, boiler room expenses, labor, renewals, repairs, etc.

From the above rate the term Readiness to Serve was evolved covering as it does all items that enter into the generation and distribution of current, provided for the central station consumer.

Arriving at a satisfactory basis of charge, for the commodity, the next step naturally was the commercializing of the central station. Instead of waiting behind a counter for a request for service, a corps of engineers and salesmen, was recruited and after a series of meetings, the plan formulated upon which rests all of the development in business-getting game.

In a 1902 convention of the National Electric Light Association, Mr. Doherty stated: "Our earnings through economy of operation have well-defined limits, but the possibilities of increasing our earnings by developing our market have a much wider range. I believe our business today might be considered as of a retail nature compared with what it will be a few years hence."

In 1907 he refers to light as synonymous with optimism. Artificial light attracts everything animate, from bugs to men and that for every dollar expended in brilliant illumination at least ten dollars of benefit will be secured to the city where the display is made.

He further stated: "Each day the commercial end of our business assumes greater and greater importance. The aggressive work being done by many central stations in the country has created a new standard of lighting, and while it is possible for the other central stations to do nothing and still reap some benefit from the works of others, it is now possible for a small expenditure of money and effort to bring splendid returns in the field of development of business."

You will note that in 1902 the merchandizing of the central station and modern methods were proposed. In 1905 by the introduction of a commercial program in the N. E. L. A. it was in effect and operation in several so called Doherty properties. Those who attended the June convention at Seattle were astounded to learn that operation was second place and that methods of increasing load factor by specialization attracted the attention of nearly everyone present.

The merchandizing of the central station proposed, rapid strides were made in the development of the business getting organization, special development such as Industrial Power, Electric Display and Advertising, Domestic and Appliance were soon created which found its own field of labor very broad, and results obtained in many central stations today are only the result of the time and energy displayed and the apostle of commercialism and those assisting him that we might have a perfect medium of doing business between the public and the corporation.

Mr. Doherty's methods might be summarized in stating that it is his rule to meet the public more than half way. In all matters affecting the interest of both the corporation and the public and that no branch of custom is too small to receive the attention of the management. As a result of this policy the term "complaint" is eliminated and those calling at the office by reason of high bills or service trouble usually leave an order and do not register a "kick."

The education of employes was inaugurated; lectures and talks were given regularly to the new business force, to the accounting department and to the operating branches on subjects of general interest. Special talks were given to the commercial department on the best way of securing business and its profitableness to the central station to secure competent men for positions in operation and management. College graduates were invited to enroll in this school of gas and electric practice. A complete course of instruction by means of lectures and by experience in all branches of central stations, developed men so that they were capable to put in force standard systems of active, modern and aggressive business getting. Efficient schemes of operation which have resulted in greatly increased earnings and which was used to acquire other properties.

It is well to bear in mind that many stations have not awakened from their lethargy and are doing nothing to hurry along the growth of their business; then, there are others who have made or are making spasmodic and irregular efforts along the new business line. Some electric lighting companies are alive to their practice and go in for the business of every character in every commodity increasing the net earnings and receiving the co-operation of the public and eliminating tendencies towards municipal control and arbitrary rulings.

[1]Read before San Francisco Development Electrical League, Oct. 8, 1912.

EXPORTS ON PORTLAND CEMENT.

Before the manufacture of Portland cement was undertaken to any great extent in the United States this country was a heavy importer of that commodity. Now, however, we are sending more cement beyond our borders than was ever imported. The largest importation of cement in one year was in 1895, when 2,997,395 barrels were brought in. For the eleven months ending in May, 1912, we exported 3,053,539 barrels. Importations promise to increase from now on.

SUMMARY OF CONCLUSIONS AND RECOMMENDATIONS FOR RAPID TRANSIT TUNNEL AT SAN FRANCISCO.

Bion J. Arnold, under date of October 7, 1912, submitted preliminary report No. 8 which supplements preliminary report No. 5 and deals with the Market street extension. This extension contemplates a rapid transit tunnel under Twin Peaks Ridge. The summary of Mr. Arnold's conclusions and recommendations is as follows:

First: Concerning Project A, main or hill section, later studies have confirmed my previous recommendation in preliminary report No. 5, that if it is determined to build at present only the main portion of the tunnel between the southwest portal and Eureka street, the northeast end of the tunnel should be built with the object of connecting at sub-grade with a future Market street subway, and not connecting directly with the surface grade. An inclined entrance would then become necessary at Eureka street which could be ultimately abandoned, or utilized for routing trolley cars to the surface at this point.

Second: Whether the tunnel is extended down Market street at the present time or not, I am convinced that the contour extension of Market street should be carried out at once while the property is relatively inexpensive.

Third: This contemplates also the construction of the contour Boulevard around Twin Peaks, as advocated by the various Improvement Associations. This low-grade extension of Market street will form the much needed traffic thoroughfare down the Peninsula, supplementing the rapid transit tunnel.

Fourth: Concerning the second section of Project A, this should be built as a two-track subway from West Mission street to Castro street along the north side of Market street at high-level; that is, with station platforms as close to the street surface as the structural design will permit. In this manner, a future parallel bore will be provided for at minimum cost, to be built at sub-level (that is, at a depth sufficient for an overhead concourse). Thence it will proceed directly through the hill at low-grade from Castro street to the southern portal.

Fifth: Acquire sufficient easement width when the first project is carried through to accommodate both present and future bores, as well as stations. The additional cost at the present time for both bores will probably be but little more than for the first.

Sixth: Considering the limitations imposed by the necessity for reasonably rapid operation through the tunnel, not more than three stations between the north and south portal appear to be desirable for the present:

"Church street," located in the valley at Fourteenth and Church streets; side platform, sidewalk entrance.

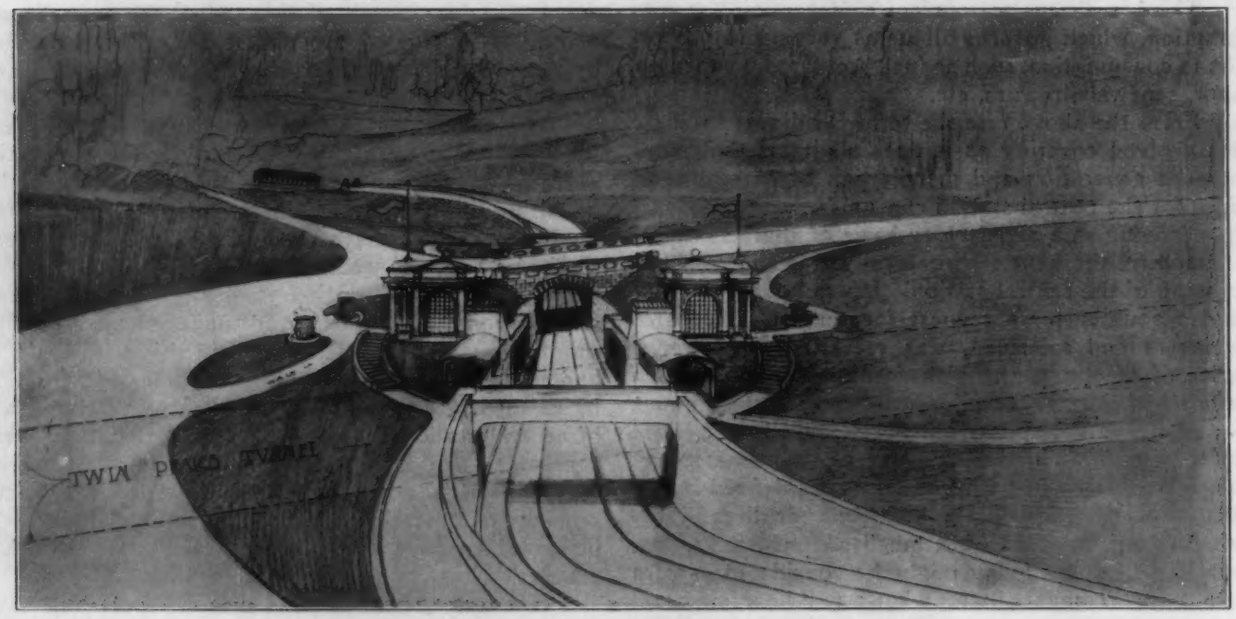
"Eureka Valley," located along Market street contour extension, between Collingwood and Eureka street; island platform, central entrance kiosk.

"Laguna Honda," located on city property at the intersection of Seventh avenue and Dewey Boulevard; side platform, escalator or ramp entrance.

One future station, "Noe street," has been provided for by raising the tunnel grade to the proper level; but this should be built for local stops, and only when the development of cross-town traffic warrants.

Seventh: Both Market street stations, at Church street and Eureka valley, should be built at high-level. Church street may be developed later into a sub-level express station later described, with the necessary direct transfer facilities between express and local platforms.

Eureka valley station may be expanded into a reservoir station as soon as traffic warrants, so as to provide "passing tracks" for through service or in conjunction with the branch-off tracks of the proposed Mission-Sunset tunnel connecting at Eureka street. This will be independent of the future low-grade bore



Perspective View of Development of Laguna Honda Transit Center.

of Project B, which will pass beneath Eureka Valley staiton, either on the same alignment or a more direct one.

Eighth: Laguna Honda station should be constructed at the highest level consistent with the maximum grade established—3 per cent—but at sufficient depth to permit a future overhead crossing beneath the surface of Dewey Boulevard for trolley cars of connecting transfer lines, this super-grade crossing to be developed as soon as traffic conditions warrant, but independent of the present tunnel station.

Laguna Honda station has been located largely on city property, and an unusual opportunity exists for effective utilization and enhancement in value of the entire city tract. The improvement of this locality and the boulevards leading thereto should therefore be undertaken by the city at its earliest opportunity. An open cut crossing for trolley cars will save much of the expense of a covered sub-grade station such as shown herein.

Ninth: The upper Market street subway section should be designed so as to connect directly at subway grade with a future four-track section extending down lower Market street. All subway branch-off lines should be designed without grade crossings. Present designs must fit into a proper scheme of future development without necessitating expensive reconstruction, particularly with reference to station structures.

Tenth: The lower Market street subway section, which will become necessary in the future, should be built with a standard four-track section, with all four tracks built at sub-level, permitting an overhead concourse from sidewalk to sidewalk beneath the street from which access may be had to both express and local platforms, with direct transfer between them. This section is well adapted for connection with the upper Market street section of Project A, as herein recommended. It is idle to consider a two-track section, because of the number of branches that will probably be required.

Eleventh: In the location of stations, provision should be made for ultimately extending the platform to accommodate the longest multiple-unit train contemplated. For the present, both high-speed interurban and trolley suburban cars will be operated through the tunnel. This dissimilarity in equipment makes it desirable for these two types to berth at separate platforms; consequently, stations not less than 350 feet in length should be provided for at present, accommodating three-car interurban trains and three trolley car units. On account of this length of platform, and the serious loss in speed due to additional stops, stations should not be built closer than 1500 or 2000 ft.

Twelfth: An inclined exit at Castro street will be required, so long as both local and express trains are operated through the hill tunnel, to relieve the Market street subway section of such locals as do not require a through run. The incline utilizes otherwise waste space west of Castro street in order to obviate an obstruction in upper Market street.

Thirteenth: Enlargement of the present two-track project to four tracks must come when the safe minimum headway has been reached, under conditions of minimum safety factor as determined by rigidly applied rules for the style of equipment and the type of signal system installed.

Fourteenth: The relative volume or headway of express and local traffic that can be accommodated effectively within the one bore should be largely determined by the necessities of express service. This is the principal object of the rapid transit project.

Fifteenth: Before traffic necessitates a second or express bore, it is likely that local suburban service can best be handled in the present bore by special subway equipment running between the city and the county line, with adequate transfer facilities en route to numerous trolley feeder lines. And as a lower Market street subway will probably also be required by this time, it will then become desirable to exclude all but standard subway equipment from the rapid transit system.

Sixteenth: When the ultimate Market street subway project is completed from the Ferry to Eureka Valley, a Market street local or transfer route will become desirable. For this purpose provision has been made at Castro street for subway locals to loop around in Eureka Valley close enough to Eighteenth street to warrant a loop terminal station for originating or transfer traffic in addition to the main Eureka Valley station herein provided for.

Seventeenth: Branch subways will unquestionably become necessary in the future, to feed the main Market street artery. These branches will be discussed in more detail later, but the development of the city seems to indicate the following as most desirable:

(1) South, or Mission branch;
(2) West, or Park-Richmond branch;
(3) Southwest, or Park-Sunset branch.

All run beneath the surface until out of the heavily settled districts.

Eighteenth: Grade separation will ultimately become necessary below the southwest portal. The present right of way contemplated along Junipero Boulevard can only be regarded as a makeshift, and ultimately the rapid transit line should be diverted one block east by open cut or sunken roadway. It is extremely important that subdivision of residential properties should be carried out with this in mind.

Nineteenth: Ventilation and automatic block signal plants will become more and more necessary as traffic through the tunnel increases. Provision for the former should be made in the original design, and some form of block signal will be required from the start, to be later perfected and amplified in order to handle effectively the denser traffic.

Twentieth: The McCoppin street portal may be retained after the upper and lower Market street bores have been connected, as a most convenient means of access to a terminal property which will presumably be located in that vicinity, at least for interurban trains. But the exact position of this portal will be dependent considerably upon the location of this terminal property.

ELECTRICAL NOTES FROM ARGENTINE.

The hydroelectric development of the Iguazu Falls consists of erecting a hydroelectric plant at the falls and conveying the electric energy sixteen miles to a site where the factory would be erected.

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The Impatient Board

Something over a year ago the city council of Los Angeles employed a board of experts to advise as to reasonable rates for electrical energies in that municipality. After an exhaustive investigation, this board made a remarkably just and comprehensive report, covering the points under investigation. In face of this report and its highly scientific methods of arriving at rate charges, the city council arbitrarily threw the entire advice aside and made an entirely new schedule, by rule of the thumb which has resulted in unscientific and unjust proportioning of electrical charges in that municipality.

Today the city of San Francisco is employing a noted expert at a costly figure to investigate the traffic situation within its confines. Thus far, information of the greatest importance to San Francisco's future growth has been gathered. The daily press of that city, however, recently detail the impatience of several members of the Board of Supervisors in awaiting the final report and it is even hinted that action may be taken on certain important matters without having at hand the mature conclusions of the traffic expert. Enquire among the critics of the recommendations that have been made thus far and their overwhelming comment is that after all the traffic expert has advised not anything really technical as was supposed would be forthcoming from such a skilled engineer, but on the other hand advice has been given such as would be dictated by anyone possessing commonsense.

In answer to this criticism all should remember that "there is one thing about common sense—it isn't common."

New Fields of Endeavor

At a recent meeting of the San Francisco Electrical Development League, W. W. Briggs forcefully brought out his convictions that a large part of our energies are expended in endeavoring to take from each other business already created rather than looking afield and seeking where activities may be better expended in the development of new applications.

Much interesting discussion concerning a new industrial application for electrical energy has taken place during the past ten days between Western power men and Dr. Samuel Eyde, the eminent inventor from Norway, an account of whose wonderful accomplishments may be found on another page of this issue. Here is a possible application for electrical energies bringing to life countless new industries and yet a decade has not passed since the initial bow of the Birkeland-Eyde process of electrically bringing about synthetic nitrogen products. This industry had its birth in a commonplace and yet, in some respects, a unique manner. About ten years ago Dr. Eyde met Professor Birkeland, a fellow countryman, at a ban-

quet in Norway. During the course of the evening Professor Birkeland, noting a far distant look in Dr. Eyde's countenance, asked what he was thinking about. Dr. Eyde replied he was thinking that if some one would give him a stroke of lightning to play with he could perfect a great invention. Professor Birkelund forthwith explained some wonderful experiments on electrical arcs he had been putting through. The next morning a patent was taken out. In 1903 the employment of two men saw the incipiency of a new industry. Today in Norway 200,000 electrical horsepower grind out eternally some 100,000 tons per annum of valuable synthetic nitrogen products. Not only does this installation contain the largest single hydroelectric power plant in the world—that at Rjukan, developing 140,000 h.p.—but power is generated, including depreciation operation and 6 per cent interest on invested capital, at the remarkable figure of $3.30 per h.p. per annum.

The West may well take a lesson from the industry and creative imagination of these Norwegian scientists and inventors. Nature has distributed water power throughout that section of America with a lavish hand. With these gigantic water powers as a stimulus, an opportunity is offered, not to develop powers to saturate a field already amply covered with electrical supply, but an opportunity is offered for the engineer of the future who possess initiative and can invent new uses and new industrial processes. Because of such initiative, not alone will the electrical fraternity reap the harvest but awaiting the engineer himself is a just and bountiful reward.

The Passing of the Wooden Flume

Hydroelectric development has indeed been rapid. In the last issue of this journal, J. D. Galloway set forth in a forceful manner the technical features encountered in hydroelectric design, the evolution of which has made possible such progress in this art. Beginning with crude methods of "cut and try," handed down from the days of forty-nine, and the hydraulic giant, the majestic impulse water wheel of today has developed into the delicately regulated mechanism, which is so well-known to all familiar with the make-up of the modern high head hydroelectric plant.

It is questionable, however, if even this remarkable evolution has not been outclassed by the forward advance in flume and canal design. The picturesque wooden flume, clinging tenaciously to the sheer cliff for its only protection from certain and complete destruction, recalls in memory strenuous days of a former generation, but the neatly lined tunnel of today, piercing this sheer cliff presents visions of construction for more in accord with modern installation. Indeed, the almost complete abandonment of the wooden flume in favor of steel and concrete applications is one of the most noticeable features of modern canal design.

In irrigation, too, the use of concrete is today wholly used in the more permanent work. In Southern California, because of the high value of water, cement and concrete for irrigation design were put into use earlier than in any other region in the United States. Moreover the San Joaquin valley of California, the Modesto and Turlock irrigation districts, are today using concrete for most of their new structures and, in fact, former wooden installation is rapidly being replaced. The great Northwest, also is arising to a full appreciation of the permanent and durable characteristics possessed by this modern evolution in canal design. On another page of this issue will, in fact be found a detailed description of the installation of a reinforced concrete canal, which has recently been installed in British Columbia and which today is found thoroughly satisfactory in its operation.

Hydraulic cement was known to the ancients. It was, as history records, used in Egypt sixteen hundred years before the Christian era. Over two thousands years ago, the Romans built sewers, water mains, and buildings, with a natural cement. The remains of some of these structures, as seen today, are monuments to the durability and permanence of this material.

This material, which may be purchased in the market today, is of different kinds and properties. Portland cement, for instance, is made of certain definite ingredients put together in just the proper proportions necessary for the theoretical chemical combination of the elements involved. These ingredients, consist approximately of three parts of lime carbonate to one part of silica, alumina, and iron oxide, which are burned to semi-fusion and the resulting clinker is then finely pulverized. Natural cement, on the other hand, is the product obtained by calcining natural clayey limestone rock at a proper heat. This product is likewise pulverized for use. Finally a third product is that known as modern puzzolan or slag cement, which is made by mixing in proper proportions a granulated blast furnace slag with slaked lime. As in the former instances, the mixture is then ground to a fine powder for application in the arts.

Each of these different types of concrete have their fields of usefulness in the up-building of Western hydroelectric enterprises. A series of articles dealing with this subject is now being prepared by a well-known coast expert and will appear in the columns of the Journal at an early date.

In conclusion, as we review in mind the passing of the wooden flume and its other associates brought into existence by a demand for early delivery of water at the lowest prices possible, we must realize that we have now entered a new order of things. In a word, the question of cost now becomes secondary in consideration while stability and permanence in structure with maximum efficiency in operation must be the watchword for the future.

PERSONALS.

H. B. Duncan, secretary of the San Bernardino Valley Gas Company, is at San Francisco.

Allen G. Jones, sales engineer with the General Electric Company's San Francisco office, is at Chicago.

J. B. Lukes, the representative of the Stone & Webster Construction Company, has returned to San Francisco after visiting Reno, Nev.

W. A. Brackenridge, vice-president of the Southern California Edison Company of Los Angeles, is at San Francisco with Mrs. Brackenridge.

H. G. McMillan, salesman for the mining department of the Fort Wayne Electric Works, is making an extensive tour of the Pacific Northwest.

R. B. Elder, Pacific Coast representative of the Moloney Electric Company, and the Ideal Electric & Manufacturing Company, is at Salt Lake City.

D. C. Greene, manager for the Oregon Power Company, at Marshfield, Oregon, has been elected president of the Marshfield Chamber of Commerce.

A. Oudin, a director of the General Electric Company, residing at Buffalo, sailed on the steamer Korea from San Francisco this week on a tour of the Orient.

A. G. Minehart Jr., representing The R. Thomas & Sons Company, is visiting the trade on the Pacific Coast. He is now in the Northwest, having just completed his rounds in California.

F. E. Vickers, Pacific Coast inspector of steam turbines for the General Electric Company, has returned to San Francisco from a visit to the works at Schenectady and other points of interest.

Dr. Thomas Addison, Pacific Coast manager of the General Electric Company, returned to his headquarters at San Francisco during the week after having visited Schenectady N. Y., and the Eastern States.

C. R. Weymouth, chief engineer of Chas. C. Moore & Company, has an interesting and comprehensive paper in the current proceedings of the A. S. M. E. on the dimensions of boiler chimneys for crude oil.

S. K. Colby, vice-president of Pierson, Roeding & Co., has returned to San Francisco from Chicago, where he attended the annual convention of the National Street Railway Association and had a royal good time.

Stone & Webster interests in the far Northwest are well represented at the Chicago Electric Railway Convention by A. B. Campbell, George Carson and E. C. Gaummitz of Seattle; G. W. Rounds of Tacoma and K. K. Carrick of Everett.

J. McA. Duncan has been appointed district manager of the Westinghouse Electric & Manufacturing Company for Pittsburgh district, in place of **W. F. Fowler,** who has resigned to accept a position with the W. S. Kuhn comporation.

H. O'Mara, superintendent for the Oregon Power Company at Marshfield, Oregon, has been elected president of the local association of company employees, and **D. McIntire,** auditor for the company, has been elected secretary.

A. E. Wishon, assistant general superintendent of the San Joaquin Light and Power Corporation, and **L. M. Peart,** electrical engineer with the company, were at San Francisco this week to appear before the State Railroad Commission.

Dr. Charles Terzaghi, an engineer representing the Austrian government, in the course of a tour of the world to inspect irrigation systems, power plant facilities and various kinds of government projects, is now in Washington and Oregon.

Herbert E. Smith, city sales manager for the Safety Insulated Wire & Cable Company at San Francisco, has returned from a six weeks' trip East, during which time he perfected arrangements to bring the future Mrs. Smith to California early in 1913.

E. Berg, an engineer of Christiania, Norway, who is acting as foreign representative for the synthetic nitrogen chemical works in which Dr. Samuel Eyde is interested, has arrived at San Francisco after having investigated the hydroelectric plants of the Pacific Northwest.

S. R. Inch, manager of the Missoula Street Railway Company of Missoula, Montana, delivered a most interesting paper at the recent Chicago convention. The paper gave details of the system so effectually in use in Missoula wherein but one man is necessary to operate the P-A-Y-E cars there employed.

A. W. Bullard, vice-president and general manager of the Great Western Power Company, expects to leave for an extentive Eastern trip early next week. He will spend some time at Schenectady, going over the plans for the high duty 3-phase generators to be manufactured by the General Electric Company for use in the extension of the Las Plumas hydroelectric station.

W. E. Barrett, general manager of the Midway Gas Company, and **H. M. Dougherty,** superintendent of construction for J. G. White on the Midway gas pipe line contract, are expected to arrive at San Francisco by the end of the week for a consultation. The 12-inch pipe extending to Los Angeles is now filled with natural gas and successful tests have been made.

Dr. Frank A. Wolf of Washington, D. C., who is the professor of physics and electrical engineering of the Bureau of Standards, Weights and Measures, is a recent San Francisco visitor. He has contributed much towards a proper development of improved apparatus, and methods of measurement, and has also engaged in research on the standard of electromotive force.

W. W. Briggs, assistant general sales manager of the Westinghouse Electric and Manufacturing Company; **A. V. Thompson, J. O. Case** and **Samuel A. Chase,** have been authorized by the Panama-Pacific International Exposition management to present to the Annual Rejuvenation of the Jovians at Pittsburg an invitation to hold the Rejuvenation of 1915 at San Francisco during the Exposition. An especially engraved invitation was forwarded to them with credentials.

OBITUARY.

Frank E. Blanchfield, until recently sales manager of the Pacific Coast department of the American Ever Ready Company, died at Oakland, Cal., October 7, 1912, after a prolonged illness. He was born at Pittsbugh, Pa., in 1885, having been on the Pacific Coast since 1905. The untimely termination of his promising career is a matter of deep regret to the host of friends who had learned to respect his high character.

FRANK E. WATTS ELECTED JUPITER AT TENTH CONVENTION SONS OF JOVE.

PITTSBURGH, PA., Oct. 17, 1912.—The tenth annual convention of the Rejuvenated Sons of Jove has come to a successful conclusion. Frank E. Watts, sales manager for the Sunbeam Incandescent Lamp Company, has been elected eleventh reigning Jupiter. The rejuvenation on Tuesday night was the finest ever. The new constitution and by-laws was adopted. The attendance at the convention was close to 750 and the meetings most spirited.

MEETING NOTICES.

San Francisco Jovian Lunch Club.

The regular weekly meeting of the Jovian Lunch Club of San Francisco was held at Tait's Cafe, October 15th. B. Badrian presented an interesting paper on Ozone. In outlining a plan for providing entertainment the governing board announced the appointment of a committee, each of whose members would provide the entertainment for one weekly meeting and in rotating as follows: Chairman, A. H. Halloran; Manufactures, A. V. Thompson; Supply Dealers, M. L. Thompson; Contractors, C. F. Butte; Central Stations, M. E. Wise; Technical, G. L. Bayley.

Portland Engineering and Architectural Societies.

The regular weekly luncheon of the Engineering and Architectural Societies was held at the Hotel Portland, October 8th. H. R. Wakeman, chairman of the Portland Section of the American Institute of Electrical Engineers, presided. Frank B. Riley, state vice-president of the Pacific Highway Association, spoke on the subject of better roads. At the meeting of October 15th, over which E. F. Lawrence presided, G. B. Hegardt, engineer of the Dock Commission, spoke on the Dock Commission's Building Ordinance Controlling the Water Front.

Portland Jovian Lunch Club.

The Jovian Lunch Club of Portland met at the Hazelwood on October 3rd to hear a talk by F. J. Lonergan, attorney, on the subject of the Referendum Petition which will come before the voters of Oregon at the special election to be held on November 2. 1912. Mr. Lonergan gave some very excellent reasons why competition in public utilites is uneconomical and cited well-known authorities who have investigated the matter of competition in lighting utilities. At the meeting on October 10th Ellis F. Lawrence outlined the plans whereby Portland's traffic is to be handled effectively and the city made more attractive. He also reported on similar work in other cities. Geo. R. Sailor is Statesman at Portland.

Electrical League of Southern California.

At the regular luncheon of the Electrical League of Southern California on October 8th, S. M. Kennedy, general agent with the Southern California Edison Company, presented an interesting paper on "The Progressive Spirit."

MEETING SAN FRANCISCO SECTION A. I. E. E.

The next meeting of the San Francisco Section of the American Institute of Electrical Engineers will be held at 8 p. m., October 25, 1912, in the Pacific Telephone & Telegraph Company's Building at New Montgomery and Jesse streets. A paper on "Modern Improvements in Electric Street Lighting Units" by C. R. Wallis will be presented. The paper will be illustrated by lantern slides. An informal table d'hote dinner will be served at Jules' cafe at 6:15, before the meeting, to which all members are invited.

NEWS OF CALIFORNIA RAILROAD COMMISSION.

October 4.

The Railroad Commission rendered a decision granting authority to the Central California Gas Company to issue $219,000 of additional bonds and $136,200 of additional preferred stock. Proceeds from the sale of the securities will be used for construction purposes and to purchase the Consolidated Heat, Light & Power Company, of Visalia and Tulare.

October 7.

The Commission rendered a decision granting the Great Western Power Company a certificate of public convenience and necessity to operate in Suisun, Fairfield and Dixon.

The Pacific Gas & Electric Company was granted permission to construct a spur track at grade across a public highway, near Towle.

The West Coast Gas, Light & Fuel Company and the Home Gas & Electric Company, of Newport Beach, applied for authority to consolidate under the name of the West Coast Gas Company, and to extend operations into the towns of Downey, Norwalk, Artesia, Somerset and Clearwater. It was also proposed that the consolidated corporation issue $250,000 of bonds.

J. H. Evans applied for a certificate of public convenience to operate a telephone system in and about Patterson, Stanislaus County.

October 9.

An amendment was made to an order granting the Oro Electric Company permission to serve certain territory in San Joaquin County outside of the city of Stockton. The Western States Gas & Electric Company, now operating in Stockton, was given permission to serve certain parts just outside the city limits.

October 10.

The Commission granted an order permitting the Pacific Light & Power Company to purchase the distributing system of the Glendale Light & Power Company for $5,200.

The Marconi Wireless Telegraph Company of America applied for permission to install a night letter service between Avalon, Catalina Island, and San Pedro, on the mainland.

EXTRACT FROM REPORT OF PROGRESS.

International Electrotechnical Commission and International Electrical Congress in San Francisco, 1915.

BY H. A. LARDNER.[1]
[1]Vice-President on Pacific Coast Relation.

The Panama-Pacific International Exposition Company has definitely assigned us a meeting room, to accommodate 100 members, and two committee rooms, for the week beginning September 6, 1915, for the use of the International Electrotechnical Commission; also an auditorium, seating about 1000, with ten committee rooms, each to seat from 100 to 250 persons, for the week beginning Monday, September 13, 1915; and they have further definitely set aside the auditorium for 1000 people, asked for, for the International Electrical Congress for the following specific hours:

Forenoon of Monday,	September 13, 1915
Afternoon of Wednesday,	September 15, 1915
Evening of Thursday,	September 16, 1915
Afternoon of Saturday,	September 18, 1915

and the ten committee rooms have been reserved for meetings to be held afternoons and evenings for the entire six days of the week.

We have the further assurance of the Exposition authorities that they have reserved the above designated accommodations for us in an auditorium to be erected in the Civic Center, at some point near the corner of Van Ness avenue and Market street. This latter location has been the subject of some discussion, but it has been decided by the Committee on Organization that they would, for various reasons, prefer this location to an auditorium located within the Exposition grounds; in fact, they have made quite a point of this, and it is with great pleasure that we can announce that we have definitely secured this assignment.

It would appear that we have now definitely settled with the Exposition authorities concerning all of the important matters which are urgent at the present time. We have official advices from the Exposition authorities that our Congress has made more definite progress than any Congress which has been proposed for 1915; and up to a very recent date we were the only Congress to whom definite dates and space for meetings had been assigned.

The American Institute of Electrical Engineers also proposes to participate in and support the International Engineering Congress, but has not seen its way clear, in view of the International Electrical Congress, to take the lead in the matter.

THE ELECTRICAL CONTRACTORS' DEPARTMENT

WIRING REQUIREMENTS AT PORTLAND.

(Concluded)

Overhead District.

(A) System.

The company operates the following system of electrical distribution from which current is supplied for light, heat and power:

(a) For Lighting, Heating and Small Motors:

A three-wire single-phase, 60-cycle alternating current system of voltage 117 and 234, approximately.

(b) For Power:

A three-conductor three-phase, 60-cycle alternating current system of voltage 234, approximately.

(c) For the Operating of High Speed Elevators and Special Apparatus Requiring Variable Speed Motors—The Company also Furnishes in Certain Districts:

A two-wire direct current system of 600 volts, approximately.

The company must be consulted before installations are made of 600 volt apparatus, as such installations will not be connected outside of certain districts, limits of which will be given upon application to the commercial department. Application for 600-volt direct current service must be made in writing, and the agreement on the part of the company to furnish such service must be obtained in writing, as no verbal agreements made by any of the company's employes will be considered binding upon the company.

(B) Wiring.

(See general requirements, Division 1, Sections A, B, and C.)

(a) All service feed wires must extend at least two (2) feet outside of all buildings and must be installed in conduit from a point ten (10) inches beyond outside wall to the meter board. Where exit light or passenger elevator circuits are to be taken off ahead of the main service switch, as called for by sections 723½ and 788 of the Building Code of the City of Portland, the branch cut-outs for same must be installed in an approved steel cabinet having a blank metal cover which can be sealed by the company. Where pull boxes are necessary, approved outlets with blank metal covers may be used.

(b) Service feed wires must be brought to outside of building at a location convenient to the lines of the company.

(c) Where it is desired to have the service feed enter the basement, the wires must be installed in a suitable conduit to a height of at least fifteen (15) feet up the side of the building or up one of company's poles.

(d) Where it is desired to install service up a pole, the company must first be consulted.

(e) Suitable return bend, goose neck or some approved outlet must be provided at top of conduit as a protection against rain where same is installed up the side of a building or up a pole.

(f) In the case of Flats, Apartments or Stores, all meters must be grouped together in one room accessible to the company's employes, with one set of service outlets for lighting, and one set of service outlets for power. Should it be necessary to group the meters in any other manner, written application must be made to the company and approval received before doing any work.

(g) In all Flats, Apartments or Stores, requiring more than one meter on lighting service, a special switch cabinet with a separate switch for each Flat, Apartment or Store, must be installed in such a manner that it can be sealed by the company, and not interfere with the cut-outs.

(h) The company will install a recording watt-hour meter upon all services, and the necessary wiring must be provided by the customer in all cases.

(i) Diagrams for wiring of meter loops for the various kinds of services were given on page 328 of the Journal, and the wiring for meters must be installed as shown in diagram.

(j) Two-wire meters will be installed on all 220-volt single-phase motors, and the service and meter loops for all such installations must be 2-wire, except in the event that lighting is taken from the same service.

(k) Meters should always be located as near as possible to the point where the service enters the building, or as near as possible to, and on customer's side of the main line switch and cut-out.

(l) The meter location must not be over seven (7) feet above the floor, nor less than two (2) feet above the floor, and the location should be dry, free from vibration, easy of access for reading and inspection, and where possible in a well-lighted place.

(m) Loops for power meters must be wired in a location that will be free from vibration when the motor is running.

(n) Cabinets installed for meters must be of a size sufficient to give clearance of at least six inches on all sides of the meter.

(o) In large installations (requiring meters of 100 amperes' capacity and over) the company should be consulted before making provision for meters, as in such cases current transformers will be installed, and provision must be made for their installation in connection with the meters.

(p) The neutral tap for the three-wire meters must in all cases be soldered to the neutral wire, and not merely fastened by a binding screw of switch or cut-out.

(q) Insulated supports for meters must be provided in all cases of installation in metal cabinets. Meter boards for this purpose will be furnished by the company upon application.

(C) Motors.

(a) Motors of less than one horsepower must be 110 to 120 volt, 60-cycle, single-phase, alternating current, except as provided in (d).

(b) Motors of one horsepower and up to two horsepower (not including two horsepower) must be 220-240 volt, 60-cycle, single-phase, alternating current, except as provided in paragraphs (d) and (e).

(c) Motors of two horsepower or over must be 220-240 volt, 60 cycle, three-phase, alternating current except as provided in paragraph (e).

(d) Where there is a two horsepower or larger 220-volt, 60-cycle, three-phase motor installed, all other motors may be of the same rating.

(e) All motors of two horsepower or less used for dumb-waiter elevator service must be 60-cycle, single-phase and of the repulsion induction type or equivalent.

(f) Where the total connected load is less than two horse power, the motor or motors may be connected to the lighting meter. If the load is two horsepower or over the wiring must be arranged for a separate meter for the motors, except in the case of motors for dumb waiter service in hotels and apartment houses.

(g) Upon all alternating current motors larger than five horsepower, special devices must be provided for reducing the current at starting.

PORTLAND ELECTRICAL CONTRACTORS' ASSOCIATION NOTES.

The regular bi-monthly meeting of the Association was held at the Bowers Hotel Tuesday evening, October 8th, there being a full attendance to welcome the representatives of the local electrical jobbing houses who had been invited as special guests.

After the excellent dinner had been served, all present adjourned to one of the private parlors where the business meeting was held. By special arrangement C. W. Abbott, sales engineer for the National Metal Molding Company, appeared before the meeting with samples of the new and much improved line his factory is now putting out. His demonstration was decidedly interesting and those present were a unit in voting the new metal molding a decided improvement over the old line.

The association has adopted the plan of having factory representatives appear before the body from time to time and demonstrate any new lines that may be of interest to the contractors. It is believed that this is a very practical idea for it gives the salesman an opportunity to speak to the contractors collectively, thus saving the time of going to each contractor's establishment. By presenting the matter in this manner, after business hours, more deliberate thought can be given to the subject presented for the petty affairs that require one's attention during the busy hours of the day have been laid aside and besides there is the benefit to be derived from the general discussion.

Following Mr. Abbott's discussion, matters of vital importance that affect the trade from both the jobbers' and contractors' interest, were freely discussed with the jobbers present until a late hour and it is hoped and believed that much good will ensue as a result of the meeting. A committee was appointed to confer with a committee from the jobbers with the object of carrying negotiations further.

The association voted to engage the services of Mr. Edwin G. Amme, on salary, as permanent secretary who would be in position to attend to the many duties connected with that office. Mr. Green, the retiring secretary, has done valiant work, all of which is greatly appreciated by the members, but the many new plans in contemplation will require so much work that no member could afford to take the necessary time from his business to properly attend to them. This innovation will probably result in a material increase in membership.

ANNUAL CONVENTION OF OREGON ELECTRICAL CONTRACTORS' ASSOCIATION.

The executive committee of the Oregon Electrical Contractors' Association is arranging plans for a two days' session at Portland at the time of the annual meeting, December 10th. Efforts will be made to prepare a program that will be full of interest and entertainment for the State members and friends so that they will feel well repaid for their viist. Details of the program will be furnished later.

ELECTRICAL CONTRACTORS' NOTES.

Engineer M. Couchot, French Bank Building, has completed the plans for the new building which is to be erected for the Department of Electricity at Alameda and which will house their lighting system and fire alarm system. The structure will be a reinforced concrete building with two frame buildings in connection. A large amount of machinery will be installed. Bids for the work are now being taken and will be opened on October 16th. Plans and specifications are in the hands of the Alameda Department of Electricity and contractors can secure the same from the Secretary of the Department at Alameda.

TRADE NOTES.

NePage-McKinney & Co. of Seattle have been awarded the contract to furnish power, light and telephone equipment for the new ten-story Multnomah Security Company building, at Portland. McNaughton & Raymond are the architects.

The Westinghouse Machine Company, East Pittsburg, reports an order from the San Diego Electric Railway Company, San Diego, Cal., for one 5000 k.v.a., 3 phase, 60 cycle, 2400 volt turbo generator set with 50 kw. direct-connected 125-volt exciter.

The Pacific Gas and Electric Company has awarded the Allis-Chalmers Company a contract for twelve 4250 k.v.a. and nine 4000 k.v.a. transformers for use on 125,000 volt circuits in connection with the new hydroelectric plants under construction on Bear River.

The John R. Cole Company of San Francisco has decided that hereafter it will not carry San Francisco stocks of the eastern factories which it represents. The company's present warehouse on Folsom street will be closed and offices will be opened in some central building, where orders will be taken for factory shipment.

The General Electric Company is finding a brisk demand for the new electric motor for oil-well service, which has just been put out. It is a motor of the Hunt type, with two speeds, and has a remarkably high-power factor on both speeds. It develops 20 h.p. on the high speed and 10 h.p. on the low speed and is said to be quite an improvement over other motors that have been in use in the California oil fields during the past year.

The American Ever Ready Company's factory at San Francisco is extremely busy on account of the increasing demand for tungsten flashlight batteries and the big Christmas tree outfit trade. A large portion of the miniature lamps and tree lighting outfits for the Pacific Coast will be made at San Francisco this season. On an average, 200 barrels of the American Ever Ready Company's batteries, etc., are being shipped daily. Big editions of two new small catalogues have just been issued.

It has been announced by The Old Mission Portland Cement Company that their mill at San Juan, San Benito County, California (formerly the San Juan Portland Cement Company) is to be completed and put into operation in the near future. The firm of Smith, Emery & Company, industrial engineers, at San Francisco and Los Angeles, have been engaged to design and erect the mill. It is expected that the output of this mill will be a factor in the market next spring.

NEW CATALOGUES.

The Crocker-Wheeler Company have issued a neat and attractive booklet concerning Ampere, N. J., in general, and their own organization at that town in particular. The booklet is a beautiful example of offset printing.

The Electric Storage Battery Company have issued an attractive booklet regarding some of the purposes for which storage batteries are adapted, giving interesting facts about them and showing how widely the batteries of this company's manufacture are used.

For the convenience of their patrons, the General Electric Company will issue, at intervals, supplements to its general supply catalogue No. 4824, showing new devices brought out since the publication of the main catalogue. Supplement No. 2 is now being distributed by the company.

The Ohio Brass Company have issued a handsome descriptive catalogue on the Tomlinson Car Coupler Equipment for electric railway service. These include the automatic radial, the automatic air connecting and the M. C. B. automatic types, as well as spring drawbar carriers, draft gears and accessories.

INDUSTRIAL

DETAILS OF OLYMPIC POWER COMPANY'S NEW INSTALLATION.

The Westinghouse Electric & Manufacturing Company, through their Seattle office have obtained an order from the Olympic Power Company, Port Angeles, Wash., for the Bremerton, Wash., extension of the transmission system, involving apparatus for the new substation at Bremerton, to serve the commercial load of the Bremerton-Charleston Light & Fuel Company and for the Navy Yard load of the Puget Sound Naval Station. The apparatus for the Bremerton substation consists of three 500 k.v.a., O. I. S. C., 66,000 volt delta connected primary, 2300 volt delta connected secondary, lowering transformers complete with Burke type, pole-top fused switches and type "GA" automatic series trip oil circuit breaker with one 2 panel switchboard with necessary integrating and graphic recording instruments.

At Porta Gamble and Port Ludlow, Wash., where they cross Hood's Canal by means of a sub-marine cable, there are two substations, one known as North Hood's Canal substation and the other as the South Hood's Canal substation. At the North Station there will be installed the following apparatus of the outdoor type: One 3-pole, single throw, fused type Burke pole-top disconnecting switch, one automatic series trip type "GA" 66,000 volt circuit breaker, three 500 k.v.a., O. I. S. C. delta-connected, 66,000 volts, high tension, 13,800 volts, and 6600 volt low tension transformers, one switchboard panel with necessary integrating and graphic recording wattmeters. The crossing will be made at a potential of 13,200 volts and it is proposed to run local lines from both the North and South substations at a potential of 6600 volts for reaching that load which can be served within an economical radius.

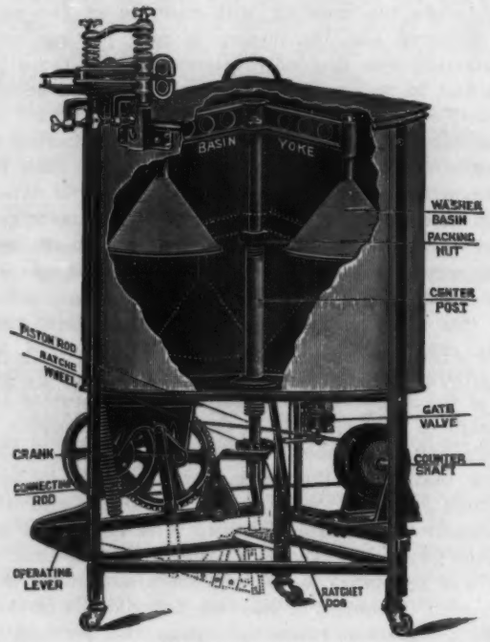
The cable will be in one length of about 9500 ft. and will be submerged to a maximum depth of 350 ft. The order has been placed with the American Steel and Wire Company, who are to install it with one year's guarantee.

At the South Hood's Canal substation there will be a bank of three 500 k.v.a. O. I. S. C. step-up transformers, 13,200 volts with 6600 volt taps for local load, high tension being 66,000 volts, both sides being delta connected.

The switching apparatus will consist of one switchboard panel with suitable indicating and recording instruments with one 3-pole single throw, Burke type pole-top mounting air brake circuit breaker or switch, with fuse attachment. Suitable lighting arresters will be placed at both North and South substations; these being Westinghouse Type "A" electrolytic, 66,000 volt delta connected. The transmission line is 66,000 volt, 3-phase neutral grounded star connected but lightning arresters and transformers are arranged for delta connection which will provide for such surges which will be imposed by faulty or inefficient ground of the neutral, if such ever occurs.

MOTOR-DRIVEN WASHING MACHINE.

The manifold advantages of the electric washing machine for the home have won for it a permanent place in the list of modern labor-saving devices. The principle of washing consists in forcing the soapsuds through the clothes. Before the advent of the washing machine, this was accomplished by rubbing the clothes against a board. The machine illustrated herewith utilizes the above principle by means of a ⅛ h.p. electric motor which raises and lowers two rust-proof metal funnels or cups through the soapy water. These cups are attached to a yoke which is in turn fastened to a center bar by thumbscrews. The bar is backed up by a compression spring that automatically adjusts the position of the cups according to the amount of clothes in the machine. The electric motor is mounted on the frame under the washtub in an accessible place from which it may easily be detached.



Motor-Driven Washing Machine.

The machine is equipped with a wringer, which is also operated by the electric motor through a set of silent, inclosed bevel gears, the power being transferred from the washer basins by a clutch lever conveniently located near the bottom of the tub. This lever can be operated to transfer the power from wringer to washer or in the reverse direction without stopping the motor. The wringer can be reversed by a small lever located near the upper roll. A gas burner for heating the water is also attached to the frame of the washer under the bottom of the tank. This device will heat the usual quantity of water to the scalding point in from twenty to thirty minutes. The entire machine is mounted on channel steel legs and roller-bearing casters. It weighs about 130 lb. and can be conveniently wheeled about the floor. It is known as the "Easy" motor washer.

The Pacific States Electric Company are distributors for the Pacific Coast.

The motor may easily be detached and made available for other household uses, such as operating the ice-cream freezer, vacuum cleaner, food chopper, emery wheels and others.

The Cutler-Hammer Clutch Company of Milwaukee has just issued two new bulletins, one describing circular type lifting magnets and the other magnetic separators. The 48-page lifting magnet bulletin contains many illustrations showing Cutler-Hammer magnets used for a great variety of purposes, inside and out, under water and in snow storms. The magnetic separators described in Bulletin 13,000 are for use in cement mills, paper pulp mills, terra cotta plants or wherever it is desired to continuously remove the magnetic contents from non-magnetic bulk material.

NEWS NOTES

INCORPORATIONS.

DIXON, CAL.—A number of farmers have organized the Maine Prairie Telephone Company, with C. Parker, president, and H. G. Brown, secretary.

SANTA BARBARA, CAL.—Articles of incorporation of the Solvang Water & Irrigation Company have been filed. Directors: Marcus Neilsen, Peter N. Thomsen and A. Christiensen. Capital stock, $15,000.

ILLUMINATION.

GLADSTONE, ORE.—The Gladstone City Council has granted a franchise for 35 years to the Portland Light & Power Company.

LOS ANGELES, CAL.—The people of Wilmington district propose to have ornamentally lighted streets, the same as in Los Angeles proper.

CHICO, CAL.—The Pacific Gas & Electric Company has placed orders for improvements to the Chico substation to the amount of practically $15,000.

YUMA, ARIZ.—Frank G. Townsend and Leandro Goodwin have formed a partnership to engage in business of supplying electric light and power.

CENTRAL POINT, ORE.—The California-Oregon Light & Power Company is to extend its lines from Jacksonville into the Applegate Valley in the near future.

EUGENE, ORE.—The water board has made a proposition to install ornamental lights in the business district and suggest that property owners pay for the installation.

SAN DIEGO, CAL.—Within the next few weeks the San Diego Consolidated Gas & Electric Company will begin the expenditure of $105,000 on extensions of its underground system of electric wiring.

EL CENTRO, CAL.—On petition of the Imperial Valley Gas Company, bids will be called for the sale of a franchise for gas pipes on county roads to cover a large part of the irrigated portion of the county.

BURNS, ORE.—A. Welch, a Portland capitalist, has taken over the electric light plant operated here for several years, and has been granted a 25 year franchise by the city council for its operation, to be ready by the first of 1913.

OLYMPIA, WASH.—Wilbur I. Forbes, representing the Oregon, Washington Railway Corporation, has asked the city council to grant him a franchise to construct an electric lighting system for this city, also a franchise to put in a water system.

DUNCAN, B. C.—C. H. E. Williams, 615 Pender street, W., Vancouver, B. C., has been awarded the contract for the erection of street lights and the installation of a lighting plant for this city. About $9500 will be expended. The contractor is receiving bids for wire, etc.

HEMET, CAL.—The Hemet-San Jacinto Gas Company, which has been owned by a stock company of outside capitalists and managed for several years by Miss Eva Herrington, was sold this week to E. A. McGillivray, a Los Angeles capitalist, who is a builder of complete gas plants and manufacturer of Beale gas apparatus.

SAN FRANCISCO, CAL.—The $600,000 issue of 5 per cent 30-year first and refunding bonds of the Western States Gas & Electric Company, recently authorized by the Railroad Commission, have been purchased by White, Weld & Company, and are being offered to the public at $95 and interest. When the bonds were authorized the commission placed the minimum sale price at $87.50, but it is stated that the company received a considerable advance over this figure. Including this issue, the company has outstanding $3,548,000 of these bonds.

STOCKTON, CAL.—The Railroad Commission has amended an order previously granted to the Oro Electric Corporation, giving it permission to serve certain territory in San Joaquin County outside the city of Stockton. The Western States Gas & Electric Company, which serves the city of Stockton, claimed that it should be entitled to serve a strip two miles wide surrounding the actual corporate limits of the city of Stockton. This strip of territory is generally regarded and spoken of as being included within the city of Stockton. The Commission granted a rehearing upon this point and amended its original order. The Western States was given permission to serve certain parts of this outside strip surrounding what is actually the city of Stockton.

EUGENE, ORE.—A proposition to purchase the municipal power plant was made to the city countil on Ocober 7th by A. Welch. Mr. Welch's proposition contemplated a fifty-year franchise to sell electrical energy in Eugene, and also embodied a specific list of rates that should be charged the city for power for use of the municipal water plant and for street lighting. The city electrical plant includes a 2400 horsepower plant at Walterville, where water is diverted from the McKenzie River and brought three miles and a half to the power plant; transmission line, substations at Eugene and a distribution system for commercial and for street lighting. The whole installation cost about $350,000.

SAN FRANCISCO, CAL.—According to an official the Great Western Power Company is having the largest business in its history. The increase in current generated for the first thirteen days of October is twelve per cent over the current generated for the same period in the month of September. This increase in current generated reflects the large increase in number of customers connected to the system during the last five months. On May 11, 7092 customers, having a connected load of 77,967 kw. were connected to the company's distributing lines. This had increased on October 11, to 9971 customers, the connected load of which was 88,803 kw. In addition to the customers connected the company still has contracted, and is rapidly connecting to October 11, to 9871 customers, the connected load of which will be 10,101 kw. and the estimated revenue from which will be $265,000 per annum. A large part of the added business is in the Northwestern District, including Solano County and a portion of Sonoma County. There has also been a heavy increase at Sacramento and above that city, where there is a great demand for power for irrigation pumping. A large number of electric pumping plants have been installed, the units averaging from 10 hp. to 20 hp.

TRANSPORTATION.

SAN BERNARDINO, CAL.—The Pacific Electric announces that it will expend $25,000 for additional improvments at Urbita Springs.

PARMA, IDAHO.—It is reported that the Oregon-Idaho Light & Power Company of Caldwell will in the spring build an electric railway between Caldwell and Weiser via this place.

SEATTLE, WASH.—The Puget Sound Traction, Light & Power Company have begun the double tracking of the Fauntleroy line. The line will be double track as far south as Myrtle street or Gatewood for the present.

RIVERSIDE, CAL.—Chief Engineer Pillsbury of the Riverside Electric is authority for the statement that work on the Riverside-San Bernardino trolley line will begin within 30 days and that the line should be in operation within 4 or 5 months.

SANDY, ORE.—A contract has been let for surface clearing of the rights of way for the Sandy extension of the Mount Hood Railway, between this place and Cottrell. A contract has been let also for the 900 feet of piling for the trestle necessary.

SAN FRANCISO, CAL.—An amicable undertsanding has at last been reached between the city and the United Railroads whereby the latter will allow the Geary street municipal tracks to be extended to the ferry in consideration of its continuance of the Sutter-street franchise.

SAN FRANCISCO, CAL.—As a result of a visit of inspection by public works commissioners and Secretary Churchill to the scene of the W. L. Holman Company's carbuilding operations, the force of workmen is to be still further increased, to the end that the first batch of 20 cars may be completed by Christmas and ready for the municipal road. From now on men will work on all holidays and there will also be night shifts.

RICHMOND, CAL.—The Southern Pacific Company has applied to the Railroad Commission for permission to purchase a railroad franchise granted by the city of Richmond to H. G. Cutting. Cutting has done no construction work under this franchise and the Southern Pacific Company wants it to complete an electric interruban system which will join the cities of Richmond, Albany, Berkeley, Oakland, Alameda and other points in the southern part of Alameda County.

EDMONTON, ALBERTA.—Official announcement is made by M. Kimpe, managing director, that the Edmonton Interurban Railway Company, incorporated in 1910, and reorganized on September 16 last, will build 300 miles of electric lines to connect Edmonton with numerous towns in Central Alberta. J. W. McLeod, contractor for construction, has 150 men on the grade for the first unit of six miles from the northwestern city limits to St. Albert, where a power house, with sufficient capacity to operate 26 miles of line, will be erected. Steel will be laid the coming winter and it is planned to have the line in operation early next June.

SALEM, ORE.—The annual report of the Portland, Railway, Light & Power Company, of Portland, Ore., to the State Railway Commission, has beeen filed. It covers the fiscal period from June 30, 1911, to June 30, 1912. The company operates in 14 cities and towns in Oregon. It has 293.5 miles of railway, and electric lighting stations in all the towns in which it operates.

The net increase, out of which must be paid taxes, bond interest and depreciation on the railway division, on June 30, 1912, for the year preceding, was $1,440,487.97. The net income of the light and power division was $1,851,804.08. The operating expenses of all divisions amounted to $2,117,414.19 and the taxes, interest on bonds and depreciation amounted to $2,276,696.01. The 4 per cent dividend amounted to $999,977.50. This left a net balance to be carried to surplus account of $440,510.47. The railway revenues were received from the interrurban lines to Estacada, Oregon City, Troutdale and Mount Hood, each being separate lines, and the street car lines in Portland. The passenger car mileage for the entire system is reported as 14,704,845. During the yar there were 68,489,930 passengers carried. The average fare paid by all persons traveling upon its lines both interurban and city, was 3.9 cents. The company reports a total number of passenger cars at 644. The company has 302 freight cars , and its total number of cars is 1157. Two persons were killed and 19 injured during the year ending June 30, 1912. There is a total railway mileage operated by the company of 293.5 The bonded indebtedness is placed at $39,000,000.

TRANSMISSION.

BURNS, ORE.—A. Welch has been granted a franchise for the operation of an electric lighting and power plant within the city for a period of 25 years.

DIXON, CAL.—The Great Western Power Company has been granted a franchise to transmit electricity in the town of Dixon for furnishing light, heat and power for the period of 50 years.

REPUBLIC, WASH.—The power line of the Washington Water Power Company is to be extended from the plant of the company on Spokane River, known as the Long Lake plant, to Republic to serve the mines and mills of the camp.

GARDNERVILLE, CAL.—The brick work on the new building of the Douglas Milling & Power Company at Gardnerville has been completed. It is planned to enlarge the power plant at a later date and eventually to extend the lines to many parts of the valley.

MILTON, ORE.—Muncipal Manager L. E. Coyle and County Surveyor Geary Kimbrell have been making a survey and estimate of the cost of constructing the barrel flume which furnishes water to run the light and power plant. A $10,000 bond issue is to be asked for constructing same.

HOOD RIVER, ORE.—The Northwestern Electric Company, now constructing a dam on the White Salmon River opposite here, may lay a cable across the Columbia River to this place and follow the Oregon side of the river to Portland where the company expects to furnish light and power.

TELEPHONE AND TELEGRAPH.

HOLBROOK, ARIZ.—More telephones will soon be installed in Snowflake and considerable improvements made, both in service to subscribers and to lines.

EVERETT, WASH.—A franchise has been granted the South Fork Telephone Company to operate a telephone line along portions of the Snohomish county roads.

CALDWELL, IDAHO.—It is announced that the power line of the Oregon-Idaho Light & Power Company will construct a high tension power line from this place to Parma.

PORTLAND, ORE.—Permission has been granted to the Pacific Telephone & Telegraph Company to proceed with the construction of its 14-story fire-proof, reinforced concrete building at Park and Oak streets.

RENO, NEV.—Not only will the Pacific Telephone & Telegraph Company surely erect a substantial building in Reno within a short time, according to N. J. Pendergast, but new switchboards and equipment will be installed that will anticipate the growth of Reno for several years.

WATERWORKS.

MADERA, CAL.—M. C. Knowles has been granted the water franchise for the city of Raymond.

SNOHOMISH, WASH.—The council has decided to commence active operation on the construction of the water system across the river.

VENICE, CAL.—A special election to vote $100,000 in bonds to extend salt water fire main, will be called in Venice some date in November.

SUISUN, CAL.—A special election will soon be called to vote upon the propostion of issuing bonds to raise money to build about two miles of pipe line for the municipal water system.

PILOT ROCK, ORE.—Money for the water bonds issued by the town of Pilot Rock, and sold to the American Water & Light Company, of Chicago, has been reecived and work will be commenced on the installation of a water system for the town.